

REMARKS

In the *non-final* Office Action mailed March 31, 2010, the Office noted that claims 1-21 were pending and rejected claims 1-21. In this amendment, claims 1-21 have been amended, no claims have been canceled, and, thus, in view of the foregoing, claims 1-21 remain pending for reconsideration which is requested. No new matter has been added. The Office's rejections and objections are traversed below.

OBJECTION TO THE SPECIFICATION

The disclosure stands objected to for informalities. In particular, the Office states that the Specification contains a misspelling. The Applicants have amended the Specification. The Applicants submit that no new matter is believed to have been added.

Withdrawal of the rejection is respectfully requested.

REJECTIONS under 35 U.S.C. § 112

Claims 1-21 stand rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. The Applicants have amended the claims to overcome the rejections. The Applicants submit that no new matter is believed to have been added by the amendment of the claims.

Withdrawal of the rejection is respectfully requested.

DOUBLE PATENTING

Claims 1-13 and 16-18 are provisionally rejected on grounds of nonstatutory obviousness-type double patenting as being unpatentable over co-pending Application No. 10/593,557, claims 3-7 and 9-22.

The Applicants note that on June 15, 2010, the claims of Application No. 10/593,557 were amended. For example, independent claim 1 was canceled and its features added to claim 3, and further amended to recite "generating said plasma including encapsulation target ions and collision ions, said collision ions having diameters that are larger than diameters of cyclic rings of fullerene molecules or nanotube molecules and having the same polarity as said encapsulation target ions... colliding said collision ions with said fullerene molecules or nanotube molecules, to deform said cyclic rings and thereby cause said fullerene molecules or nanotube molecules to encapsulate said encapsulation target ions, respectively." Claim 13 was also amended in the co-pending application. The Applicants submit that the amendment of the co-pending application makes the claims patentably distinct.

Claims 14-15 and 19-21 are provisionally rejected on grounds of nonstatutory obviousness-type double patenting as being unpatentable over co-pending Application No. 10/593,557,

claims 3-7 and 9-22 in view of Hirata and further in view of Pietzak.

For at least the reasons discussed above, the Applicants assert that the claims are patentably distinct.

Claims 1-21 are provisionally rejected on grounds of nonstatutory obviousness-type double patenting as being unpatentable over co-pending Application No. 10/581,441, or, 11/659,210, or 10/786,914, claims 3-7 and 9-22 in view of Hirata and further in view of Pietzak or Hatakeyama.

Claim 12 of Application No. 10/581,441 recites "fullerene introducing means for introducing a fullerene into plasma comprised of  $M^+$  and electrons to produce a fullerene ion" and claim 13 recites "[a] system for manufacturing a fullerene derivative comprising means for generating high electron temperature plasma whose electron energy is kept 15 to 50 eV in order to generate a positive monovalent ion  $M^+$  from a gas containing an atom M which acts as a moiety in the production of a fullerene derivative."

Claim 12 of 10/581,441 is the claim of an apparatus wherein fullerene is injected into plasma, not toward a substrate (the present invention). Claim 13 of 10/581,441 is the claim of an apparatus wherein plasma is generated with high electron temperature whose electron energy is kept 15 to 50eV, so that monovalent nitrogen ion is efficiently generated. Such a feature is patentably distinct from the present claims.

Application No. 11/659,210 is later filed and any terminal disclaimer is properly made in that Application.

Application No. 10/786,914 recites in claim 1, "Plasma treatment equipment in which a chamber wall and a susceptor electrode having the same DC potential are AC shorted to each other." Claim 11 recites in part "wherein the bottom wall of the plasma chamber and the shield of the susceptor electrode have the same DC potential, wherein the bottom wall of the plasma chamber and the shield of the susceptor electrode are AC shorted to each other by a metal plate, said metal plate having a first end connected to a first short point on the shield and a second end connected to a second short point on the bottom wall of the chamber." Claim 12 recites "wherein the side wall of the plasma chamber and the shield of the susceptor electrode have the same DC potential, and wherein the side wall of the plasma chamber and the shield of the susceptor electrode are AC shorted to each other by a metal plate, said metal plate having a first end connected to a first short point on the shield and a second end connected to a second short point on the side wall of the chamber." Claim 13 recites "wherein at least one of the electrode and the electrode shield being at the same DC potential as the chamber wall is AC shorted to the chamber wall." Claim 23 recites "a susceptor electrode disposed within the plasma chamber, said susceptor electrode comprising at least one of an electrode and an electrode shield, the electrode shield disposed

adjacent to said electrode, wherein the wall of the plasma chamber and at least one of the electrode and the electrode shield have the same DC potential, and wherein the wall of the plasma chamber and the electrode shield are AC shorted to each other."

The technique described in claims 1, 11-13 of 10/786,914 are the technique to effectuate AC shunt between susceptor electrode and plasma chamber wall with same DC potential to inhibit the increase of mutual conductance which causes decrease of power consumption efficiency, decrease of growth rate of film deposition, and degradation of film quality. Therefore, the technique disclosed and claimed by 10/786,914 is patentably distinct from the present invention wherein vacuum chamber has different electric potential from deposition-assistance substrate, and that DC bias voltage is applied on deposition-assistance substrate. Therefore, the rejection for overlapping the present invention and 10/786,914 will be resolved even in view of the magnetic field disclosed by Hirata.

Withdrawal of the provisional rejection is respectfully requested.

REJECTIONS under 35 U.S.C. § 102

Claims 1-5, 9, 16 and 17 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Miyake Koji, JP 2000-012285. The Applicants respectfully disagree and traverse the rejection with an argument and amendment.

The Applicants have amended claim 1 to recite "transporting the plasma onto a **deposition** substrate under an influence of a magnetic field, **wherein the direction of the applied magnetic field is from the plasma generation means to the deposition substrate.**" Support for the amendment may be found, for example, in Fig. 1, ¶¶ [0060], [0064] and [0167]. The Applicants submit that no new matter is added by the amendment of claim 1. Claims 16 and 17 have been amended in a manner consistent with the amendment of claim 1.

The purpose of the technology disclosed by Miyake is to produce SOI substrate using simple structure production apparatus without mass separator and to reduce production cost. For that purpose, plasma is intermittently generated to efficiently generate hydrogen negative ions, and pulse bias voltage is applied to the substrate to implant selectively hydrogen negative ions into the substrate. Due to these technical characteristics, ions are not implanted efficiently because the cycle is repeated during which implantation is stopped, which is different from the present invention. The purpose of Miyake is not high efficient ion implantation, which is not the same as the purpose of the present invention. This means that it is difficult to create the present invention which enables high density ion implantation even with a low energy in view of the disclosure of Miyake. So the present invention has patentability even considering Miyake Koji that oven vapor supply 117 in Fig. 7 of Miyake is consistent

with material film deposition means in the present invention. But the oven vapor supply disclosed in Miyake is an apparatus to attach CS at the surface of target which will be removed afterward, so it cannot be called "material film deposition means."

For at least the reasons discussed above, claims 1, 16 and 17 and the claims dependent therefrom are not anticipated by Miyake.

Claims 1-6, 9, 11 and 16-18 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Hirata, The  $K^+C_{60}^-$  Plasma for Material Processing. The Applicants respectfully disagree and traverse the rejection with an argument and amendment.

Claims 1, 16 and 17 were amended as described above.

Hirata is completely different from the present invention. According to the disclosure of Hirata, fullerene vapor is injected toward plasma, so that fullerene molecules bind with electrons to form fullerene ions, fullerene ions bind with potassium ions to form molecules denoted by K-C60, and K-C60 film is deposited on a deposition substrate. Meanwhile, according to the present invention, fullerene vapor is injected toward the deposition-assistance substrate, so that fullerene film is deposited on a deposition-assistance substrate. In the embodiment described in the specification of the present invention, alkali metal ions are implanted into this fullerene film.

Binding between fullerene ions and potassium ions is done in three-dimensional space in Hirata, therefore binding probability is comparatively small. In the present invention, implantation target ions are implanted into deposited fullerene film on the deposition-assistance substrate which can be called binding in two dimensional space and then bind with fullerene molecules. Therefore, the binding probability is comparatively high and binding efficiency can be improved.

Accordingly, the technology disclosed by Hirate does not correspond to "the plasma is irradiated to the material film deposited on the deposition-assistance substrate." Furthermore, the technology is not even an ion implantation. They apply a bias voltage on a substrate, but the purpose of this bias voltage is to accelerate one and de-accelerate the other among positive ions and negative ions that form plasma, and not to control implantation energy disclosed by the present invention. (P.291, left column, line 5 of Hirata, "a different potential  $\Phi_{ap}$  is applied to each substrate with respect to the earthed hot plate to accelerate or reflect the plasma particles selectively.")

For at least the reasons discussed above, claims 1, 16 and 17 and the claims dependent therefrom are not anticipated by Hirata.

Withdrawal of the rejections is respectfully requested.

REJECTIONS under 35 U.S.C. § 103

Claims 10, 11, 14 and 18-20 stand rejected under 35 U.S.C. § 103(a) as being obvious over Miyake Koji. The Applicants respectfully disagree and traverse the rejection with an argument.

Claims 10, 11, 14 and 18-20 are allowable as being dependent from allowable base claims as discussed above.

Claims 12, 13 and 21 stand rejected under 35 U.S.C. § 103(a) as being obvious over Miyake Koji in view of Yamashita Mutsuo, JP 2003-313662. The Applicants respectfully disagree and traverse the rejection with an argument.

On pages 12 and 13 of the Office Action, it is asserted that Yamashita Mutsuo discloses water cooling of structures in targets 2 and 10. But production apparatus disclosed in Yamashita Mutsuo is a sputtering apparatus. Sputtering is a process whereby atoms are ejected from a solid target material due to bombardment of the target by energetic particles such as plasma. So "target" disclosed by Yamashita does not correspond to a deposition substrate in the present invention which is a substrate where material film is deposited. Accordingly, cooling means disclosed by Yamashita Mutsuo does not teach cooling means described in claims 15 and 21 of the present invention.

For at least the reasons discussed above, Miyake Koji and Yamashita Mutsuo, taken separately or in combination, fail to

render obvious the features of claims 12, 13 and 21.

Claims 6-8 and 15 stand rejected under 35 U.S.C. § 103(a) as being obvious over Miyake Koji in view of Watanabe Satoshi, U.S. Patent Publication No. 2002/255518. The Applicants respectfully disagree and traverse the rejection with an argument.

Miyake Koji, while specifically discussing ion implantation with respect to semiconductor substrates or also with mention of metal or insulators substrates, does not particularly discuss ion implantation of a substrate or a coating that it may comprise fullerene. However, Watanabe Satoshi provides teachings which indicate that it is desirable and known to employ ion implantation techniques on substrates that have a paper deposited coating of fullerene thereon. Also, it is known to employ a plasma apparatus as illustrated in Koji which reasonably could be expected to be effective for other specific substrates such as Watanabe's fullerene coated substrates.

Ion implantation disclosed by Watanabe is the technology including the production steps comprising:

selecting and extracting ions of single isotope element from ions of several different elements in generated plasma using mass analyzer; implanting extracted ions into thin film target, wherein fullerene film is pre-deposited on the target by evaporation coating; and producing containing-fullerene.

Mass analyzer is indispensable for implantation

apparatus disclosed by Watanabe because they need to extract desired element from a plurality of radioisotope elements. Meanwhile, in the present invention, mass analyzer is not necessary because isotope elements are not distinguished.

For at least the reasons discussed above, Miyake Koji and Watanabe Satoshi, taken separately or in combination, fail to render obvious the features of claims 6-8 and 15.

Claims 7, 8, 10, 14, 18 and 19 stand rejected under 35 U.S.C. § 103(a) as being obvious over Hirata. The Applicants respectfully disagree and traverse the rejection with an argument.

Claims 7, 8, 10, 14, 18 and 19 are allowable as being dependent from otherwise allowable base claims as discussed above.

Claims 15 and 21 stand rejected under 35 U.S.C. § 103(a) as being obvious over Hirata in view of Pietzak, Properties of Endohedral N@C<sub>60</sub>. The Applicants respectfully disagree and traverse the rejection with an argument.

Pietzak discusses Kauffman-type ion source which generate ion beam consisting of two positive ions of N<sub>2</sub><sup>+</sup> and N<sup>+</sup>. This ion beam consists of only positive ions, so implantation method of Pietzak is different from that of the present invention wherein plasma comprising of positive charged particles and negative charged particles is transported. Therefore, though a water cooling system to cool substrate is disclosed in Fig. 1 of

Pietzak, Pietzak does not teach the present invention even in view of Hirata.

For at least the reasons discussed above, Hirata and Pietzak, taken separately or in combination, fail to render obvious the features of claims 15 and 21.

Claims 12 and 13 stand rejected under 35 U.S.C. § 103(a) as being obvious over Hirata in view of Yamashita Mutsuo or Hatakeyama, Characteristics and Applications of Fullerene Plasmas or Phenomena of Steady State Discharge Plasma and Their Applications. The Applicants respectfully disagree and traverse the rejection with an argument.

Yamashita Mutsuo or Hatakeyama adds nothing to the deficiencies of Hirata as applied against the base claims. Therefore, Hirata and Yamashita Mutsuo or Hatakeyama, taken separately or in combination, fail to render obvious the features of claims 12 and 13.

Withdrawal of the rejections is respectfully requested.

#### SUMMARY

It is submitted that the claims satisfy the requirements of 35 U.S.C. §§ 112, 102 and 103. It is also submitted that claims 1-21 continue to be allowable. It is further submitted that the claims are not taught, disclosed or suggested by the prior art. The claims are therefore in a condition suitable for allowance. An early Notice of Allowance

is requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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